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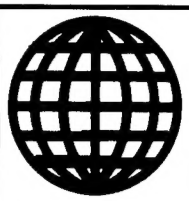

JPRS Report

Science & Technology

Europe

FIRST INTERNATIONAL COMPUTERS COMMUNICATIONS CONFERENCE

JPRS-EST-90-010
15 MAY 1990

SCIENCE & TECHNOLOGY

EUROPE

FIRST INTERNATIONAL COMPUTERS COMMUNICATIONS CONFERENCE

36980025 Budapest EAST EUROCOMM '89, PROCEEDINGS OF THE FIRST INTERNATIONAL COMPUTERS COMMUNICATIONS CONFERENCE in English 25-26 Oct 89 pp 1-217.

[Selected papers from the First International Computers Communications Conference, held 25-26 Oct 89 in Budapest, organized by Hungarian Scientific Society for Telecommunications, John Von Neumann Society for Computing Sciences, and Prosperious International Exhibitions PTE Ltd. of Singapore.]

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Hungarian Telecommunications Facing New Horizons

36980025 Budapest EAST EUROCOMM '89, PROCEEDINGS OF THE FIRST INTERNATIONAL COMPUTERS COMMUNICATIONS CONFERENCE in English 25-26 Oct 89 pp 10-20

[Article by Alajos Kauser, Central Administration of the Hungarian Post and Telecommunications, Budapest]

[Text] As for the oncoming ten years, a dynamic development of the Hungarian telecommunications shall be executed in order to eliminate the backlog in telecommunications services. This development program requires fundamental changes in the entire operational system of telecommunications. The legal framework shall be modified by a reasonable releasing of the state monopoly. Technological transition shall be implemented with simultaneous structural adjustment of industry. The Hungarian PTT shall reshuffle its existing structure in order to preserve its positions in the competition brought about by liberalisation.

From the year 1881 when the first telephone exchange started operating in Hungary up to the second world war the Hungarian telephone network developed together with the increasing demands. After the damages caused by World War II were renovated however development has slowed down. From the 1950-es the limited financial resources could not even cover the costs of maintenance. From that period onwards telecommunication services were unable to meet growing demands in quality or quantity.

The postponement of development has been limiting the availability of services both in space and in time: the development of the telephone network lagged behind that of the settlements, the manually operated telephone exchanges could only be used during the working hours of the post offices. The queues of people waiting for telephone lines grew faster than the capacities of the exchanges and the network, consequently the Hungarian Post could no longer offer the services for all who wanted to use them. The system of shortages has led to a ranking of those applying for telephone lines, bringing about a system of distribution. However this system could not solve the basic problem, namely that the number of people queuing up for telephones has kept on growing with an ever lengthening waiting time for phones.

The station-distributing order introduced gave preference to state administration and to companies in view of the development goals of the national economy. This has led to a situation where operating telephone stations form distorted compositions in two aspects: on the one hand the rate of business telephone stations to private stations is very high, and on the other hand the number of extensions is almost identical to the number of the main stations. This means that the specific traffic of the stations in the telephone network is significantly higher than the traffic for which the exchanges were designed, thus the network is overloaded. In the automatic telephone exchanges one has to wait long for the dial tone, a growing number of the calls give the busy sound, and in the manual service the waiting time keeps on growing.

Limited financial possibilities have led to the postponement of the required reconstructions, gradually deteriorating the technical state of the network. This is especially true with the equipments and subscribers network of the local exchanges and with the low rate of replacing the openwire networks.

The deterioration of the quality of the services, the authoritative attitude of the PTT in the public relations are reflected in the image the population has on the PTT. In a public opinion poll conducted in 1988 on the telecommunication services of the Hungarian PTT the public gave the mark 3.6 which means only a good average.

To change the situation radically in the field of the telephone services the Hungarian PTT has elaborated the Long Term Concept of the Development of the Telecommunication Network, and a 10-year program as the first part of its implementation.

This 10-year program aims to solve three basic problems:

--to restore the capability of the network through the reconstruction of the obsolete parts of the network and through the extension of the traffic capacity of the telephone exchanges and transmission paths;

--by the automation of the exchanges and the extension of their capacities the elimination of the limitations in the availability of the service both in space and in time, so, that by 2000 the waiting time for a new station should be less than one year;

--parallel with these developments a change in the technical system towards the digital switching and transmission technology to make possible the introduction of the value added services and the establishment of ISDN.

A key issue of the 10-year development program is to have the Hungarian telecommunication industry produce modern, digital technical facilities. Within the frameworks of the development program the Hungarian Post plans to employ analogue systems only up to 1994, and only for the extension of the existing systems. In addition to the stored program controlled urban and rural exchanges and the high capacity optical transmission systems the Post also want to have modern operation and maintenance systems integrated

into the system or in a centralised form suited for network control. As part of the industrial restructuring program faster results may be obtained by the establishment of joint venture companies with the participation of foreign working capital than with a system of exclusively buying licenses, adapting them to Hungarian conditions and based on them manufacturing the required facilities. In view also of the single European market in 1992 the Hungarian telecommunication industry shall have to become more organically integrated into the international division of labour; it has to extend its international cooperation relations.

The 10-year program foresees roughly 3 million new telephone stations to be set up in a coordinated form in the fields of telephone exchanges, local and inter-urban networks. At the same time the telecommunication sector plans to have a much faster speed of development in the non-voice services. This dynamical development, which is 3.5 times faster compared to the present situation, requires fundamental changes in the entire functional system of the Hungarian telecommunication. The telecommunication legislative framework has to be modified: greater possibilities need to be given for development by a justified and reasonable easing of the present ownership and service monopolies of the public sector. The Hungarian Post will have to rebuild its existing structure to become able to perform over three times the present volume of tasks, and to be able to preserve its positions in a service competition that will develop as a result of liberalisation.

Of the coming changes undoubtedly the most important will be the new law on telecommunication the draft of which, among others foresees to end the monopoly of public ownership and services. The extent of that liberalisation--which is to be decided on by the National Assembly which shall select one from among the different versions presented to it--shall be decisive from the aspects of future changes. For the telecommunication sector facing the problem of limited resources for development the easing of the ownership monopoly offers the necessary solution by making it possible to invite domestic and foreign working capital to contribute to the development fund. Thus, among the present conditions it is necessary to take this step. At the same time it must not be forgotten, that the full elimination of the state monopoly may, in the extreme case lead to a situation where a too high rate of foreign ownership would make the state lose direct control over the telecommunication companies. Considering the important role telecommunication plays in state administration, in the national economy and last but not least in state security and defense it is justified to have the monopoly of public ownership retained to a certain level. Undoubtedly this calls for a political decision of high responsibility.

Similarly important is to consider the level which has to be retained as public servicing monopoly. In an information society a basic requirement in the area of the telecommunication network is to maintain the responsibility for the telecommunication provision and the technical, traffic and servicing unity of the sector, and thus the availability of the basic telecommunication infrastructure has to be guaranteed by the state. As long as the ownership and servicing monopolies of the state prevail it is the state owned telecommunication organisation which enjoys the monopoly rights but is

responsible for the supply and must provide for the unity of the network. On a liberalised telecommunication market however the development of the telecommunication network becomes a business proposition, which for the users means that investments are concentrated and competition is more alive in areas, where investments promise fastest returns, bring highest profits. Economically backward areas, regions in disadvantageous situation do not invite profit oriented capital investments. Yet without telecommunication regions of that type cannot hope to develop. It is not accidental, that so far telecommunication has been liberalised in countries only, where the level of the development of the telecommunication network is no longer linked to the issue of the responsibility for the telecommunication provision. Unfortunately we in Hungary did not as yet reach that level and so in the case of liberalising the service the state will have to remain responsible for the availability of the service and the unity of the network. In a telecommunication system operating among market conditions the responsibility for the telecommunication provision will have to be arranged for with the help of market regulators: financial incentives and subsidies, the means for which must come from areas which bring higher than average profit. Thus to provide for the telecommunication provision the state will have to intervene in the market by redistributing the funds. In other words in a situation where the network is underdeveloped, unable to meet the requirements, not even nearly meet them, liberalisation has to be limited in one way or the other.

The first step in restructuring the Hungarian Post was the decision taken at the beginning of this year to set up the Ministry of Transport, Telecommunication and Construction which is now responsible for the governmental tasks related to postal and telecommunication services leaving only the tasks concerning a company with the Hungarian Post. As a company it has become primarily profit-oriented. In order to get a clear picture on the revenue conditions of telecommunication, in 1990 the traditional post and telecommunication shall become separate organisations to eliminate the present conditions of cross-financing. The independent telecommunication company which shall operate as a share company shall have the possibility, given by the law of corporation, to widen the range of shareholders, creating economic conditions for inviting foreign capital.

The new telecommunication company shall in the future concentrate primarily on services and investment and construction tasks related to the development of the network shall be performed by main contractors doing them on turn key basis. The main contractors shall be selected from among bidders to tenders, domestic and foreign specialised companies, foreign trading and finance organisations.

The organisational and preparatory works in progress gradually disclose the new paths of the Hungarian telecommunication system. These are the paths the Hungarian Post will have to follow in the changed economic and social conditions, with a new organisation and renewed attitude.

Application of Fiber Optics in Telecommunications in Hong Kong

36980025 Budapest EAST EUROCOMM '89, PROCEEDINGS OF THE FIRST INTERNATIONAL COMPUTERS COMMUNICATIONS CONFERENCE in English 25-26 Oct 89 pp 44-61

[Article by M. G. Hadfield and W. F. Sin, Transmission Division, Hong Kong Telephone Company, Hong Kong]

[Text] Abstract

Hong Kong Telephone has employed fibre optic technology in its transmission network since 1981. Fibre optic transmission systems are used to facilitate the digitalization of the Hong Kong Telephone network and also in the provision of new non-voice services, such as private video and multi-megabit leased datalines. The potentials of fibre optic systems are large, and in this paper, some examples will be given to illustrate how the attributes of fibre optic systems are exploited in Hong Kong Telephone.

1. Introduction

The first optical system in the Hong Kong Telephone network was introduced in 1981. It was a 45 Mbit/s multimode digital system capable of transporting 672 voice channels over a repeaterless distance of 8 km. Multimode systems were used initially with operation wavelength progressing quickly from 0.85 um to 1.3 um. Along with the advances in optoelectronic technology, single mode optical systems were introduced in the network in 1987 which further increased the transmission bandwidth and repeaterless distance coverage.

The digitalization of the Hong Kong Telephone network was started in the mid-1960's with PCM systems carried on copper cables. With the introduction of higher bit rate optical transmission systems, the digitalization process was speeded up rapidly. There were more than 50 percent analogue working junction circuits in 1982, but there are now (at July 1989) 97 percent junction circuits being carried by digital means and 69 percent of these digital line sections are carried on optical systems. By taking advantage of the inherent virtually unlimited bandwidth capability of optical fibers, provision of new customer services such as private video, ISDN (Integrated Services Digital Network) and multi-megabit leased datalines is also being implemented.

2. The Optical Fiber Cable Network

2.1 The Junction Optical Fiber Cable Network

Fifty-one of our telephone exchanges and 9 hill-top radio transmitter sites are connected with optical fiber cables with connection also extended to Guangdong Province in the Peoples Republic of China. Up to July 1989, a total of 528 kilometers of multimode and 371 kilometers of single mode optical cables have been installed, giving fiber lengths of 12,335 kilometers of multimode and 9,606 kilometers of single mode. Figure 1 shows the installed and proposed cable lengths.

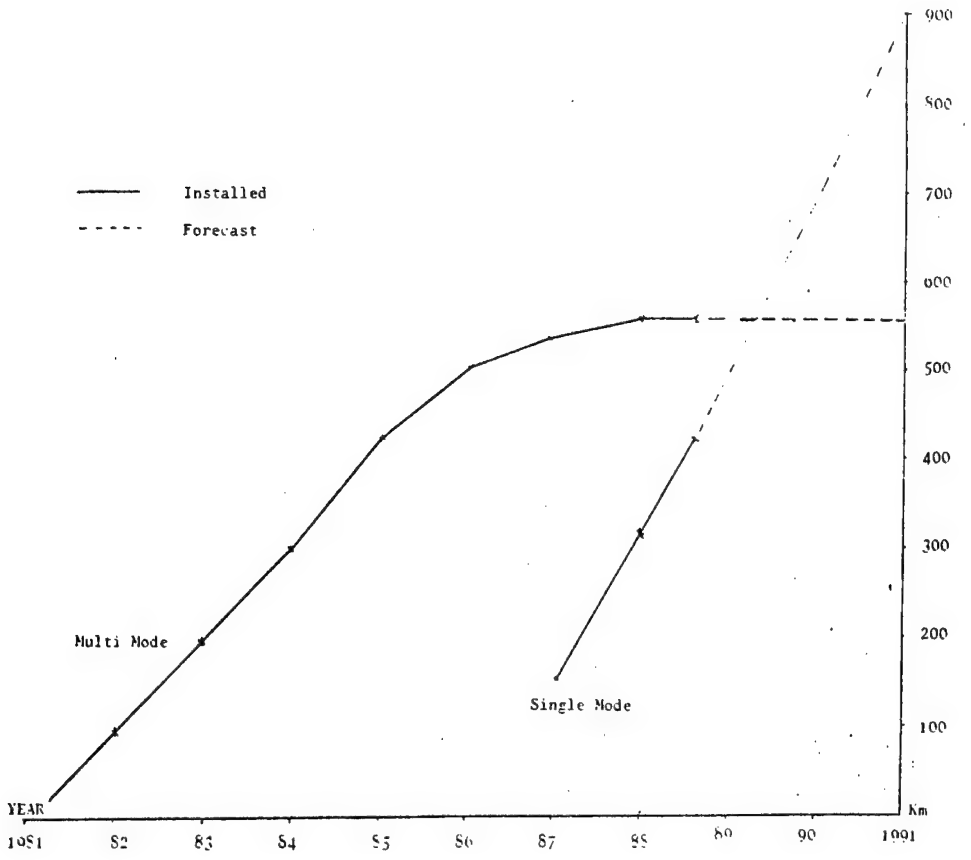

Figure 1. Installed and Proposed Cable Length (km)

Optical cables with 6, 12, 24 and 48 fiber cores are being used in the junction network, the cable size adopted for individual cable routes varying according to forecast traffic demand and the degree of junction diversity required. Figure 2 shows the optical fiber junction network in diagrammatic form superimposed on a map of the territory of Hong Kong.

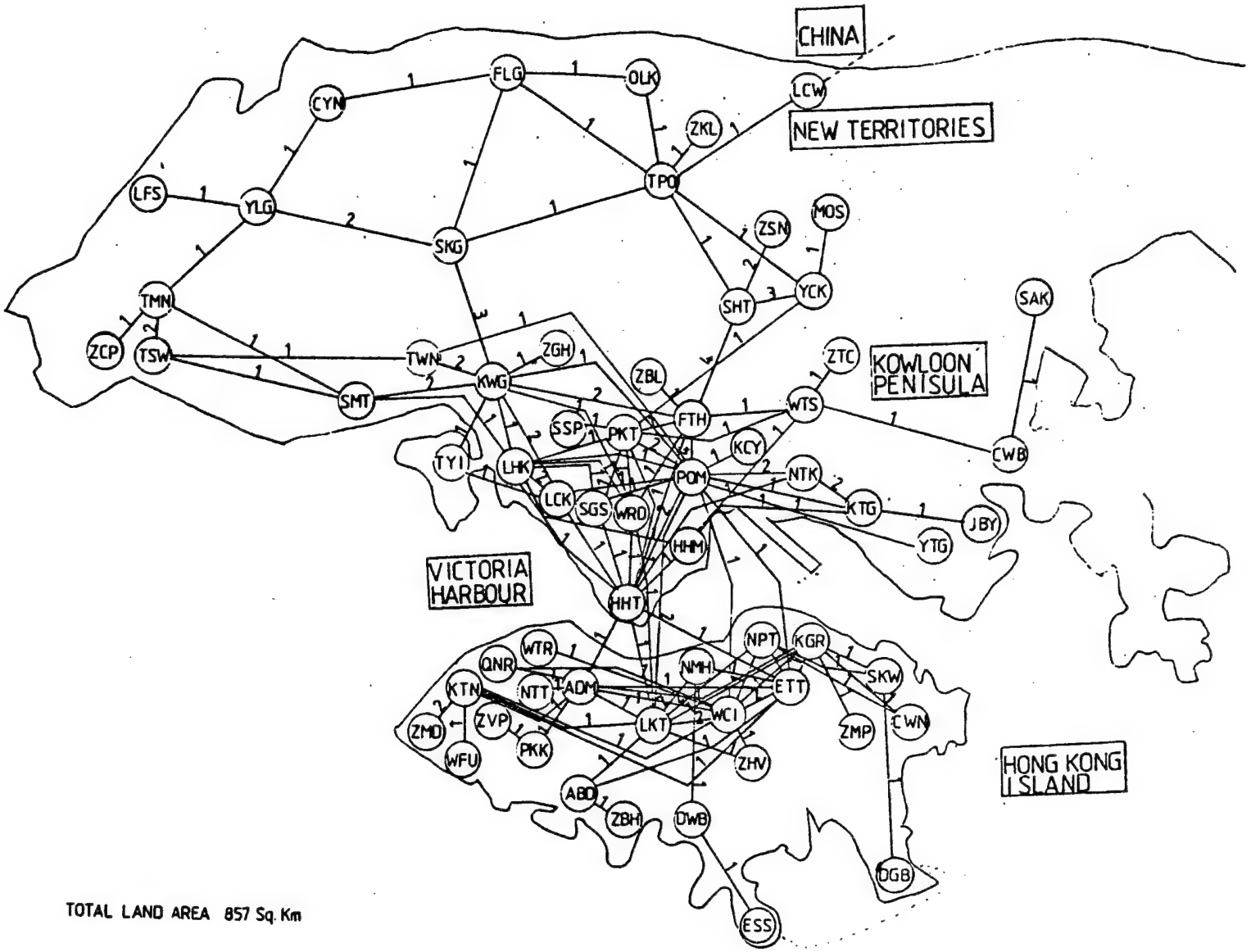

Figure 2. Hong Kong Telephone Co. Optical Fibre Junction Network

2.2 The Local Optical Fiber Cable Network

Up to July 1989, 54 commercial buildings and hotels have been connected with optical cables. In planning of the local optical cable network, normally high fiber-count cables (typically 96 fiber cores) are terminated at the telephone exchange end and tapered-down to smaller fiber-count cables (48, 24, 12 fiber cores) so as to maximize the exchange lead-in and cable duct utilization. Six fibers are led into each building.

In view of the rapid advances in optoelectronic technology which is leading to a world-wide trend in developing local optical access, Hong Kong Telephone is now actively studying the various methodologies and plans greater development of fiber in the local loop (i.e. that part of the network between the exchange and the customer's premises) in Hong Kong. Up to this time, planned local fiber distribution networks have been installed in two major commercial areas in Hong Kong Island, namely, Central and Wan Chai, with a third area on the Kowloon peninsula planned.

In these areas, which have been identified as being potential areas of demand for wideband services, users are to be connected with fibers. Tapered star topology was adopted for the fiber loop in Central and a pair of tapered star networks was planned for Wan Chai (Figure 3). The two tapered star networks in Wan Chai are originated from two different telephone exchanges running to the selected buildings via different routes so that 50 percent traffic can be maintained in case of a cable fault occurring in any one of the cable routes. It is anticipated that more commercial areas will be implemented with fiber network of similar topology in the coming few years.

The single mode fibers installed in both the junction and local networks have characteristics specified for both 1.3 um and 1.55 um regions. With the enlarging proliferation of 1.55 um optical devices, it is expected that the 1.55 um fiber-optic equipment will soon become economical in the inter-exchange trunking applications.

3. Optical Systems Overview

A variety of optical systems have been installed in the network, but only digital fiber-optic systems based on the North America digital hierarchy (1.544 Mb/s, 6.312 Mb/s, 44.736 Mb/s) are deployed in the junction network. A typical system block diagram is depicted in Figure 4, and shows the various levels of multiplex from the 1.544 Mb/s (T1) level which is the standard interface level with modern digital telephone exchanges, to the 45, 90 or 135 Mb/s optical line transmission rates we are using. A hot standby optical line terminal is installed for each junction route, the protection switch will divert traffic from a faulty terminal to the standby terminal in case of failure to avoid serious traffic interruption.

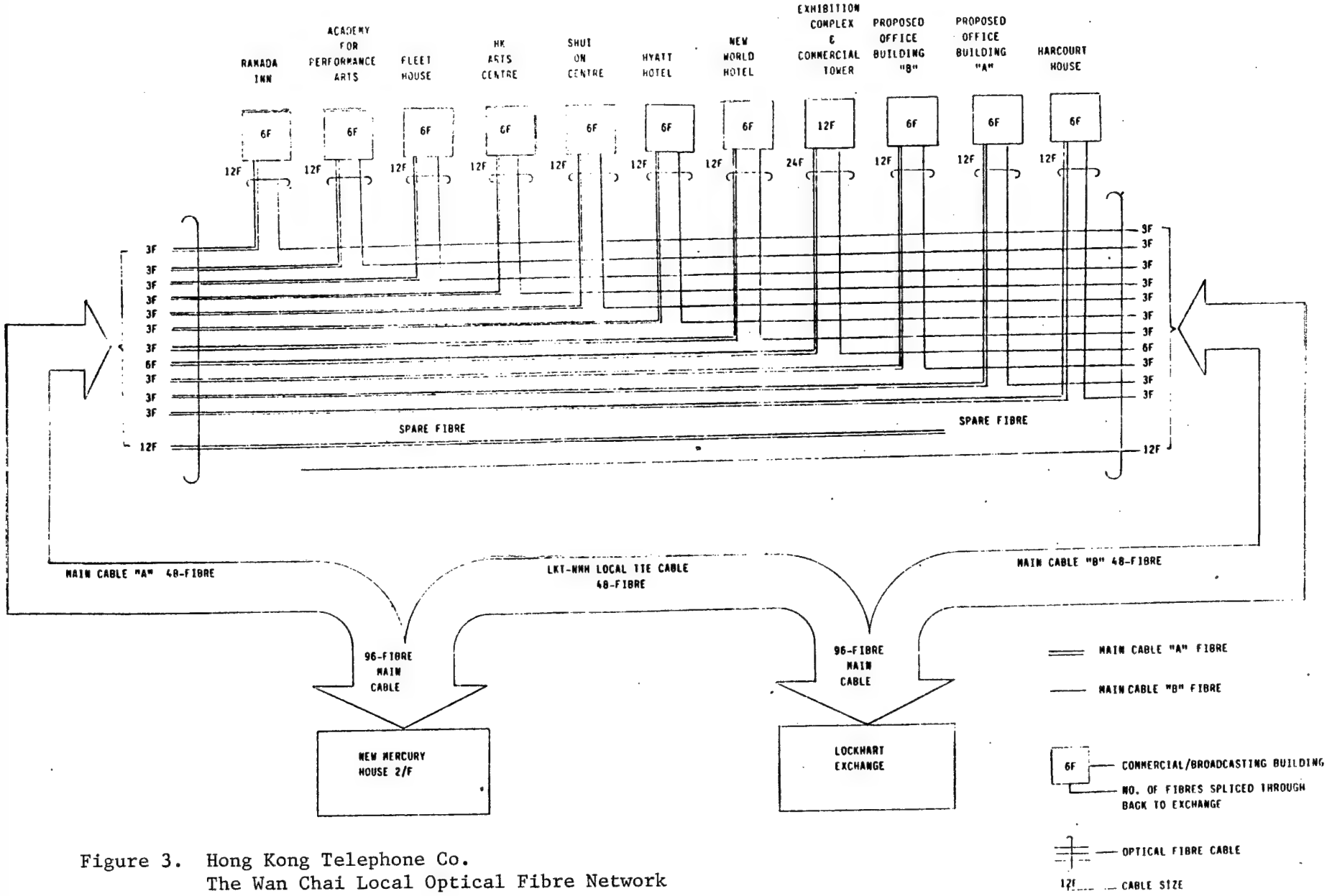

Figure 3. Hong Kong Telephone Co.
The Wan Chai Local Optical Fibre Network

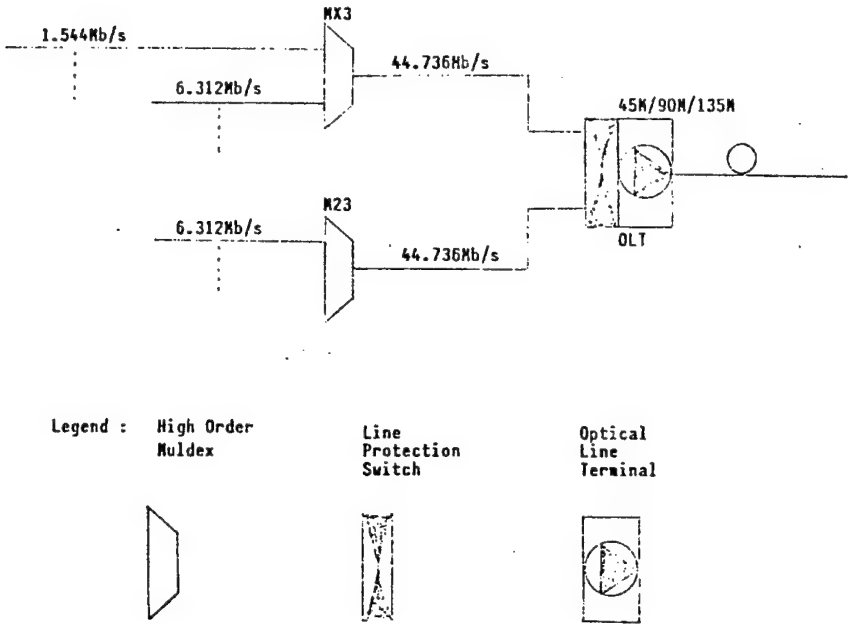

Figure 4. Multiplex Levels and Transmission Terminal

Systems employed in the local fiber network are of necessity more mixed. Although the North American hierarchy predominates, with a rapidly increasing number of customers demanding T1 service, there are also some CEPT standard links and some carrying video signals. Figure 5 gives a typical setup of the method of provision of a private customer T1 link using fiber cable from end to end, the local ends being served by optical modems. Currently, the following services are provided over fiber:

a) 1544 kbit/s (T1) dataline
b) 2048 kbit/s dataline
c) Videolink (PAL I system)
d) FDDI (Fiber Distributed Data Interface)

In both junction and local optical fiber networks laser diodes are predominantly used as the light source to meet speed and emission power requirements. In the optical receivers, avalanche photodiodes are predominantly used as direct detectors.

4. Standard Interfaces

In order to allow for a general application of fiber-optic systems in the transmission network, it is essential that the equipment interfaces are compatible with those of installed transmission systems and existing switching equipment. All the digital signal interfaces of the high order multiplex and optical terminating equipment are in compliance with the characteristics of electrical interfaces specified in Recommendation G.703 of the International Telegraph and Telephone Consultative Committee (CCITT).

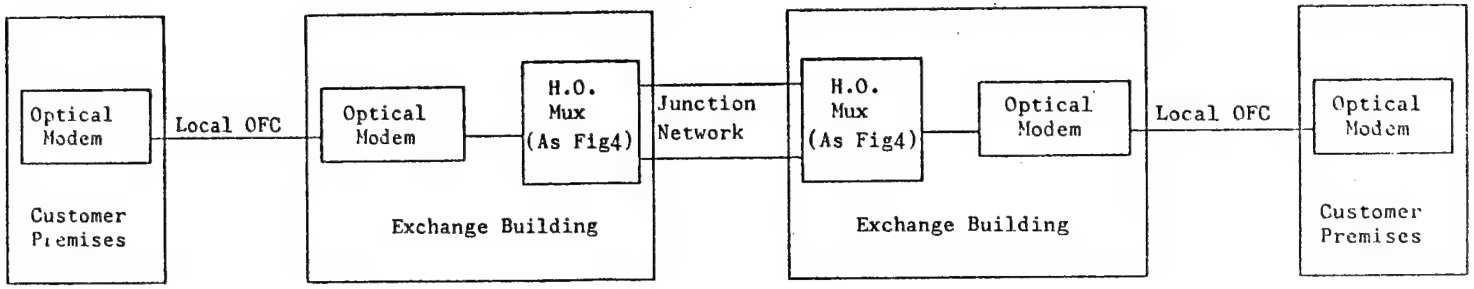

Figure 5. Typical Arrangement of Point to Point Private T1 Link

The send and receive optical ports of the optical terminal are terminated with separate fiber cords. The geometrical and optical characteristics of the optical fiber are specified to fully meet the relevant CCITT Recommendations, namely G.651 for 50/125 um multimode fibers, and G.652 for 10/125 um single mode fibers. The type of optical connectors adopted for single mode systems is the NTT-FC/PC (Physical Contact) type for single core termination, which is a common standard in the marketplace.

5. Systems Monitoring

One of the main concerns in operations is to maintain the service quality and to restore service quickly when an interruption occurs. Extensive on-line performance monitoring facilities are provided in the optical terminals to locate degraded equipment and register faulty events. The continuous surveillance reduces the effects of failures and performance degradations on the availability of the system, and provides an early indication of troubles that may affect a large volume of traffic.

Continuously monitored are the bit error performance, frame alignment signal, loss of incoming and going digital signals, drop in optical power at the transmitter and receiver, change of threshold current of laser diode, and the level of electrical power supply.

When an unacceptable level is detected, audible and visual alarms are activated to alert the maintenance units locally at the equipment room. The minor alarm indicates that a failure is on the verge of jeopardizing the continuity and integrity of the transmission, while the major alarm signifies that a service outage has occurred and prompt corrective action is required.

Additionally, visual status displays on the failed equipment indicate the nature of failures detected, and these indications are essential aids in the analysis and interpretation of alarms. The alarms and status indications must be clear and unambiguous such that the failures can be identified accurately and the troubles localized readily: To facilitate sectionalization of failures, the failed equipment forces an alarm indication signal downstream to stop the onward propagation of degraded signals and hence unnecessary alarms in the following sections. Moreover a remote station alarm is issued at the far end station denoting a failure at the opposite end. Furthermore, at the front of equipment, there are protected test points whereby standard test equipment can be interfaced to perform monitoring and testing on the system.

Other than in-service performance monitoring and comprehensive status and alarm indications, local and remote loopback facilities are provided in the optical terminal to permit trouble sectionalization at one station, and speedy identification and replacement of failed equipment and defective units.

The auxiliary channel designed into the optical terminal provides a supervisory channel for the transport of remoting, reporting and control signals.

Furthermore, orderwire facilities are provided for voice communications between craft persons working at the terminating stations.

6. Future Developments

A comprehensive junction optical cable network has been developed within Hong Kong, and now Hong Kong Telephone is actively developing the local optical cable network to allow quick response to customer services requirements. In order to further increase the capacity of our fiber network, optical directional couplers are currently being used on certain junction routes to allow simultaneous transmission of optical carriers over a single strand of fiber. Wavelength division multiplexers are now being evaluated and will be deployed in the network soon. These are expected to increase application flexibility especially in the local fiber network. The development of SONET (Synchronous Digital Hierarchy) based systems is also being closely monitored, and a trial is expected to be carried out in 1990. The use of fiber in the local loop and "Fiber to the Home" is being followed carefully as are the developments in Metropolitan Area Networks (MAN), particularly the newly emerging IEEE 802.6 standard for the double bus MAN.

ISDN Prospects in Hungary

36980025 Budapest EAST EUROCOMM '89, PROCEEDINGS OF THE FIRST INTERNATIONAL COMPUTERS COMMUNICATIONS CONFERENCE in English 25-26 Oct 89 pp 75-84

[Article by G. Sallai and G. Huszty, Research Institute of the Hungarian Posts and Telecommunications, Budapest]

[Text] Abstract

In the developed countries the establishment of an information-orientated society based on the technological innovations of telecommunications and computer sciences is becoming more and more reasonable. The strategical significance of the telecommunication is also recognized in Hungary. To ensure the international compatibility of the network in the future the digitalization of the telephone network, the diversification and integration of the telecom services is required. The development and modernization of the Hungarian networks are based on strategical plans, fundamental technical plans, computer-aided techno-economic studies, developed by the Research Institute of the Hungarian P&T. The ISDN strategy has been also established, presently focusing on the preliminary steps of the penetration of ISDN's. Pre-ISDN type solutions are also taken into account and preferred. The paper presents the main steps of the strategical plans, the pre-ISDN developments made and planned, and the present applications and expectable demands for ISDN in the near future in Hungary.

1. Evolution of Hungarian Telecommunications Network

The Hungarian telecommunications network is underdeveloped with respect to the GDP level of the country. Though the telephone density is higher than the world average, but it is less than half of the European average density. Therefore a very intensive network development and modernization plan has been prepared for the next decade. The full automation of the telephone service and more than 40 telephone sets per 100 inhabitants should be attained by 2000, the diversification and integration of the telecommunications services are also required. The digitalization of the Hungarian telephone network began more than 10 years ago. Presently the ratio of the digital transmission systems in the metropolitan networks is about 50 percent. In the Budapest city network there are third order digital microwave and optical links in addition to the common primary PCM connections. The digitalization of the transmission network is firmly going on. The

Hungarian Posts and Telecommunications Administration installed the first stored program controlled digital switching centre at the beginning of 1989, and is going to install only digital exchanges from 1992.

The intensive expansion and digitalization of the telecommunication networks necessitate a systematic and computer-aided network planning activity. In addition to the strategical and technical plans since 1976 the Research Institute of the Hungarian P&T (PKI) has been developing computer tools to assist in the telephone network planning activity. The LONET-INTERNET program system has been adapted to personal computer IBM PC AT and widely used in the planning of the digitalization of the Budapest and other urban networks, the Hungarian long-distance network as well as several rural networks. The telecommunication services provided by the Hungarian Posts and Telecommunications, are offered on separated networks.

The ISDN strategy has been also established, presently focusing on the preliminary steps of the penetration of ISDN's. Digital subscriber access, i.e. pre-ISDN type solutions are also taken into account.

2. ISDN Strategies

The ISDN deployment schedule is very ambitious all over the developed world, including the Far-East countries. This schedule is explained by the existing demand of business customers and by the initial success of pre-ISDN type services. As regards pre-ISDN, one can remember the British Telecom efforts at the early 1980's, the Japanese activities, the Finnish DIGINET or the French PTT's Transcom network. In these cases there is a strong national telecom industrial support with the leadership in developing pre-ISDN and ISDN equipment. Other countries such as FRG in Europe or the Republic of Korea in the Far-East adapted a fast ISDN introduction plan, without preliminary solutions. The efforts in both cases result in a nationwide ISDN, which can provide a basis for a Europe-wide or world-wide ISDN, not later than 1995.

The strategical significance of the telecommunication has been recognized in Hungary too. It is obvious however, that the Hungarian way towards the ISDN has to differ from the strategy of the developed countries. To preserve the international compatibility of the Hungarian telecom network the first step is the forced digitization of the telephone network. Hereupon, based on the digital transmission and switching facilities the introduction of the No. 7 common channel signalling system is unavoidable.

The next step should be the digitization of the subscriber network, that is to put the codec as near as possible to the customer premises. There are two basic opportunities, so as:

--to implement the full 144 kbit/s ISDN solution or

--to introduce the 80 kbit/s digital subscriber access or pre-ISDN as an intermediate step.

3. Preliminary Step in Hungary Towards the ISDN, the Pre-ISDN

An accelerated development plan of the telephone network, including digitalization is going to be accepted by the Hungarian government. Taking the advantages of the expected digital telephone network, it seems to be wise to develop a 64 kbit/s circuit switched network, using an 80 kbit/s subscriber access. The required network terminations (NT's) are simple, because they must contain only the BORSCHT functions including the codec, the CCITT V.110 based modem functions and of course the circuitry for the 80 kbit/s two-wire transmission method (TCM or ECM).

The exchange termination (ET) side of the network should be also simple, because only the subscriber line card in the telephone exchange should be changed or modified. The signalling facilities should be the same, and in case of data transmission a switchover capability must be introduced into the NT side.

The main difference between pre-ISDN and ISDN is, that in the first case only one 64 kbit/s channel is suitable for speech or data transmission, however, only limited modifications are necessary in the telephone network (Figure 1). In the second case one can establish voice and data communication simultaneously but the necessary new D-channel protocol and other modifications are significant in the network.

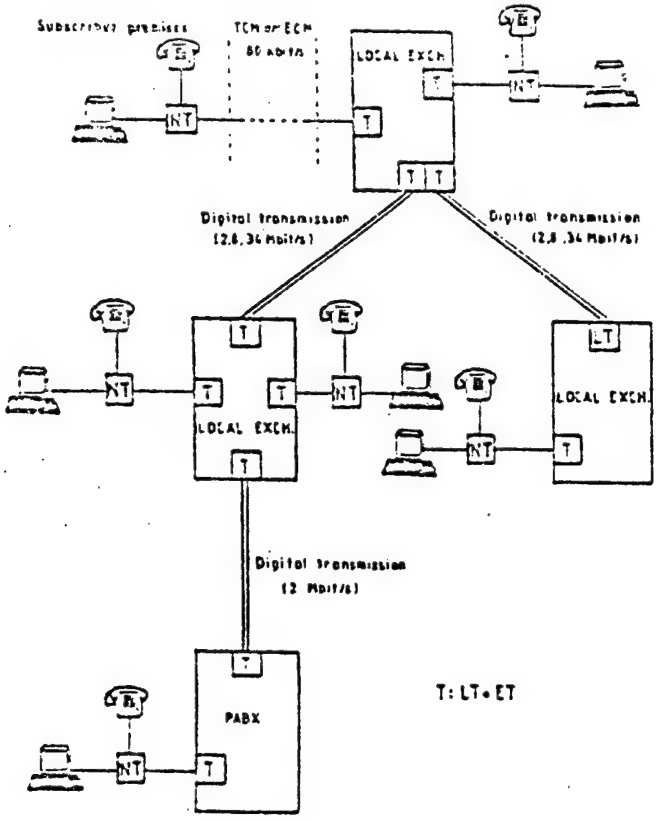

Figure 1. Pre-ISDN Networking

Based on the expected rapid growth of the telephone IDN one can build an overlay type pre-ISDN network using the existing digital switching facilities. It is quite sure that the demand for alternate voice/data transmission will be very high from the beginning, and the voice and data PABX customers are expected to subscribe for the pre-ISDN service. The traffic behavior of an "alternate" user will differ from that of an only voice type, therefore traffic forecasting and dimensioning methods are required. The pre-ISDN type services might be very popular between residential customers too, because of the expected low price and the simple access method of the services.

4. Transition to ISDN

Telephony IDN, pre-ISDN and ISDN are different, simultaneously existing networks, therefore the following question has to be answered: Is there any role of a pre-ISDN network in the ISDN era?

If the ISDN product market is available for the telecom network owners then the answer is no, definitely no. In case of restrictions, however, one must think about the pre-ISDN too. We have the feeling, that in a country like Hungary for the next 10 years the pre-ISDN will be a reasonable service mainly for the business customers. It is not expected, however, that the dominant portion of the customers will subscribe for ISDN in the next 10 years in Hungary. The introduction strategy of public ISDN, could be very similar to that of other countries: we also prefer the overlay type solution. As a first step, one local exchange with ISDN facilities should be installed in all large local networks, as for example in Budapest. The ISDN demand of customers far from the exchange should be fulfilled with remote units, as ISDN concentrators. Such a manner we can provide ISDN services for the most important business users during short time. In order to ensure the nationwide coverage of the overlay ISDN network, ISDN toll exchanges are to be put into operation step by step. On the other hand, the role of PABX's with ISDN capability is expected to be very important in Hungary.

5. The PKI's ISDN Activity

The Research Institute (PKI) has a very important role in the ISDN development in Hungary. The Institute developed the strategical plan for the implementation of pre-ISDN and ISDN services, in coincidence with the intensive expansion and digitalization of the telephone network. The national specifications for a No. 7 Signalling System, including ISUP and for Digital Subscriber Signalling System (DSS1) are under development. The first in-house ISDN connection, using the standardized "S"-interface and D-channel Signalling was established in the Institute early this year.

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The Present State of Information Technology

36980025 Budapest EAST EUROCOMM '89, PROCEEDINGS OF THE FIRST INTERNATIONAL COMPUTERS COMMUNICATIONS CONFERENCE in English 25-26 Oct 89 pp 128-136

[Article by L. Abraham, Videoton Electronics Company, Szekesfehervar, Hungary]

[Text] According to the history books, in the contemporary age there were several revolutions, indicating the improvement of technology. It began with the industrial revolution. There is no need to talk about its results. It was followed by the scientific-technical revolution, which turned the world we live in today. And inside this revolution a new one is hiding.

This is the revolution of information. Information, as we mean it today, the media, the processing of information has already existed years before, but evolution has just begun to turn into revolution. This is the result of the widespread and quickening of processes concerning information. The train of developed world is leaving the station with full speed. But where is improvement of technology in Hungary? I'm sorry to say that we are wasting time at a ticket-office and do not know how difficult it will be to catch up with the fast train.

It is a matter of fact that technical improvement in Hungary is slower than it should be. And it is even slower if we look at the results of technical improvement in computer technique. Of course it has its objective and subjective, external and internal reasons, which I can sum up as the following:

--The low stage of cooperational relations
--Parallel developments
--Low quality solutions
--The lack of development sources and currency
--The system of interests isn't encouraging
--The embargo against Hungary

We'd better dwell now upon these ideas.

In past years economic units didn't reach such a market influence which would have enabled them to establish a cooperation between one another. There were times--at least we thought there were--when by the mere tasks division on the

market it was impossible to precipitate the solution of a problem. This phenomenon sometimes can be traced inside the economic units, although it occurs rarely now.

As economic units keep their ideas and developments in secret, it often occurred that many people were working on the very same problem. It was impossible for the country's institutions to coordinate this, that's why 2-3-times more than needed people were working on the very same problem. Because of the isolation the research time didn't become shorter and less qualified specialists could solve another problem.

The contraselection experienced in the technically progressive intellectual society is reflected on the level of the resolution of the technical problems. What concerns big enterprises because of the lack of the well-functioning stimulation, in case of the small ones--because of their exaggerated interest in getting income in the sphere of the computers' boom. Still, there are exceptions. It's a matter of fact that there are plenty of illusory "cheap" solutions.

As far as I'm concerned the enterprises staying in the vanguard of the world production spend 5-10 percent of their turnover on research and development. If the sum they get seems little to them, the state helps significantly. In our country this sum constitutes 5 percent or even less. What's more, in Hungary a 1 person's turnover 3,5 or 10 times less than that of a world's level. Thus, the sources needed for the good development are far from being suitable. The obtaining of a hard currency, needed for a modernized technique represents an even greater problem.

The payment structure which had been formed on big enterprises doesn't motivate engineers to reach extraordinary results. A great step forward would be a system of author's fee royalty and introduction of licence fees. Still, these measures can't solve the problem of a stimulation because a monthly fixed salary of an engineer isn't enough to appreciate a routine reproduction on an increasing scale. The system of stimulation better functions on small enterprises, on the other hand they don't possess the sources of power from which serious results are hoped to be obtained.

The announcement of an embargo means an obstacle for the development of a socialist world system. It's a very effective mode, I should say. The big enterprises don't dare violate the COCOM prescriptions for the reason they are frightened by an essential losing of a market. Small enterprises are already more liberal what concerns the question, but they can't guarantee judicial and other details required by the world market. Their markets are as determined as possible. My opinion is as follows: if our partners want to choose our country of all European society, then we must get a possibility to integrate into the international division of labour, which is meant to be better reasoned, more liberal and must contain a package of COCOM prescriptions free of any trade discrimination. Please, think it over thoroughly!

In spite of the above described difficulties we have the results which can't be underestimated. We have developed and manufactured a computer which possesses a structure of a 32 byte element basis, also by our development.

These are the main technical characteristics of this computer:

--2-3 MIPS
--1-3 MELOPS
--8 Mbytes RAM
--a graphical mains coupler of 1280 x 1024 resolution.

A hardware may be completed by UNIX compatible, so called D MOS operation system, so that program languages of a high level such as FORTRAN, C, PASCAL etc. can be used.

The computer is designed for 2 main spheres:

a) automatization of an office
b) the working station system of a designer

The automatization of offices requires the construction of special hardwares and interfaces such as scanner, a background storage of a big capacity, a printer of better quality, a telex and telefx interface, a mains coupler etc. Partly these accessories are obtainable of our own production.

We created a needed software by developing and bringing into our system of integration an import software basis.

Nowadays we have at our disposal these services:

a) archivation of letters
b) observation over a time-fixed
c) text-building
d) electronic post
e) management of a data basis

The designer systems can be created by completing it with a hardware of different directions. It's necessary to have also a display with a suitable resolution, a mouse and a tablet for the data introduction, short time storages of big capacity, besides printers plotters are also needed for the data issue. These accessories are largely can be obtained from the domestic sources. [sentence as published]

In this case a software also was created by the integration of import basic elements. The service of engineer system design consists of 4 [as published] duties:

a) design of machinery
b) electronical design
c) PCB design

Some groups provide the following main services:

a. --2D and 3D graphics, test modelling
   --counting of final elements
   --generalization of a CNC program
   --mold flow analysis
   --etc.

b. --frequency analysis
   --time analysis
   --etc.

c. --18 layer treatment
   --taking into consideration of technological parameters (a line of 100 μ wide etc.)
   --generalization of a test program
   --etc.

d. --electronic analysis
   --lay out generalization
   --lay out analysis

Great efforts were needed to develop magnet storages of 2.5 Mbyte and 5 Mbyte of our own production. It was a good product for COMECON in those times.

Later 8-floppy storages came into being, which replaced a 5 1/4" formatum. Two sides double thicked variant of 720 Kbytes was also developed which wasn't brought into a large serial production.

In the field of Winchester disks we could reach a storage capacity of 10 Mbyte, but the development was not followed by a considerable production.

As for peripherials, considerable results have been obtained through the production of line printers. We bought the whole licence and know-how of the production of line printer from the American Data Products. As a result of this, both the characterdrum and character band versions were produced here in a range of 300, 600 and 900 line/min. By further development of the licence the 1200 lines/min version has also been constructed and produced. This is a clear evidence of the fact that the purchase of licence does not necessarily cause the conservation of the results of the technical development. The rapid development that can be reached by buying licences can even be continued by further development at a higher level.

I can mention here the Latin and Cyril character printers as an example.

We have reached similar results with another type of printers, the matrix printer. At the beginning we produced only the version of a simple 9 needles construction. Through a purpose development the paper tractor system has been up-dated, as a result of which you can print onto cut paper as well, which is a basic requirement for office automation; with the so called ruby shift solution the quality of printing can be improved. Through the

development of electronic the services of the printer can be extended, the printer became more intelligent parallel with the acceleration of the speed rate.

For the moment, the number of needles and consequently the resolution is being increased.

A couple of years ago we started with the development of laser printers. Supported by researches carried out at universities, we developed the first laser printers. The printing quality, resolution and speed rate completely corresponded to the level of that time. Unfortunately, in want of a partner for industrial cooperation we could not start with serial production, because the price would thus considerably exceed the world market price. This is a good demonstration of the direct effect of the embargo.

Videoterminals are considered to be a traditional product in our country today. We produce them both in monochrome and colour as well as in alpha-numeric and graphic versions. It is worthy of mention that we released the VT 210 and VT 240 emulations about at the same time as the big manufacturers. A lot of intellectual value is represented in this product through the emulations and custom-designed services. It is characteristic to the labour division and the domestic capability for boards and the final assembly of purchased parts are home-made. A further feature of the product is that the high resolution versions were made in the frame of a small undertaking. Nevertheless, the mass production is still keeping us waiting.

In the field of mass storages an intensive development is carried out all over the world with the appearance of optical storages. Hungary also endeavours to do its share in this work. The production of CD-audio media and drive has already been solved, providing good experiences to the home manufacturing CD-ROM, CD once writable and CD rewritable media and drives.

The research and experimental developments of BME provide encouraging results, but the industrial production of devices and media still requires a lot of further development.

The optical storages--through their reliability and extremely large memory capacity--can be integrated into several systems. They can be used not only for performing of archivation tasks but also to store engineering design systems. The preparation of softwares for the optical storages and their integration into the existing operation systems requires a large capacity of software development. There will be a great demand for storages in the world market, but first of all in the socialist countries, where the required storages has not been available.

In the field of elaboration of software the Hungarian engineers and software experts achieved an international rank. It's mainly due to the fact, that they could start from a good educational basis and that software writing required at the beginning relatively slight means. Therefore software writing to foreign software houses or human exports are not rare. Nevertheless, in spite of writing a lot of good, witty and intentive softwares also starts

staying behind the front-rank. This is chiefly a consequence of the fact, that writing is not a question of paper and pencil, eventually a PC any more, but it requires sophisticated engineering systems. Besides, we miss the big software houses in the country, where the handling and structuring of large projects could have been developed. In this situation we have the possibility to write larger and/or smaller bits only, and here we also may get to the periphery.

All development results and attempts explained above show that Hungary is capable of developments in the most up-to-date projects and of being involved into such developments. What we are not good in, is putting into production in due time. This is mainly caused by the facts enlisted in the introduction of this paper, which should be solved one after the other. Our participation in the international integration could provide a couple of good examples and may enforce progressive solutions.

The solution of one part of the problems seems to be our internal tasks. Therefore I ask you to support the Hungarian efforts to participate in technical-economic integration and please, try to achieve that the COCOM-list should serve strategic-defensive aims only, not needlessly preventing the establishment of technical, scientific, economic and commercial relations.

Computer Communication in the GDR--A Researcher's Point of View

36980025 Budapest EAST EUROCOMM '89, PROCEEDINGS OF THE FIRST INTERNATIONAL COMPUTERS COMMUNICATIONS CONFERENCE in English 25-26 Oct 89 pp 169-178

[Article by Volker Heymer, Academy of Sciences of the GDR, Institute of Informatics and Computing Technique, Berlin]

[Text] Abstract

Computer Communication has a long history in the GDR. Terminal networks are since the 60s products, distributed by Kombinat Robotron. The development of the first computer network based on a packet switched data network begun in 1974 at the Academy. The picture nowadays is dominated by local area networks and a small experimental X.25 packet network. Research and development are underway to ensure the usage of OSI communication in the 90s. The next step is the interconnection of the major amount of PCs, mini computers and main frames via LAN and the possibility of their global mutual access through a public data network.

1. Introduction

Computer Communication has a long history in the GDR. Since the 60s terminal networks are products, distributed by Kombinat Robotron. They are dedicated to the two product lines, the ES and SM computers of the CMEA countries. Based on the ES transmission technology in the early 80s the Computer Communication Network of the Kombinat Datenverarbeitung was developed. It connects ES and SM computers as well as PCs. File transfer is the basic service available to the user.

Open networking was started in the GDR in 1974 with the computer network project DELTA.[1] The aim of DELTA was the interconnection of the heterogeneous types of computers used this time in the GDR. The architectural model consisted of 8 layers. The data transmission was based on a packet switched subnetwork with a connectionless service. The line speed between the nodes was 48 Kbit/s. The research work on the computer network DELTA opened the way to our present activities in Open Systems Interconnection and the related application areas.

International co-operation in the field of computer communication exists both in the production area and in the research area. There are running terminal networks with units from vendors of different CMEA countries. Scientific contacts exist to research institutes in eastern and western countries.

2. Computer Communication Equipment

The LAN technology has been available at the beginning of the 80s. The first LAN equipment was developed for 8-bit PCs on the basis of the U880 chip set. A CSMA/CD access method was implemented with a transmission rate of 500 Kbit/s. Various controllers, also with a deterministic access method, were elaborated at the University of Technology Dresden and are known under the label LOTUNET.[2] The Robotron counterpart is ROLANET1.[3] It connects the PC1715, ES1834, BC5120 personal computer and ES1055/1057 mainframes. The user all over the network has to his disposition the functions of the SCP operating system including a file and print server and can access the ES mainframe in terminal mode. The 10 Mbit/s Ethernet compatible LAN ROLANET2[4] is under development. The RONAS controller for the K1840 is available. Other controllers will follow.

In the field of wide area networks beside the circuit switched non-automated public data network of the Deutsche Post between 1980 and 1988 the packet switched data network of DELTA was in operation. Developed at the Institute of Informatics and Computing Technique (IIR) it was followed by a new switching node BMP-8. This small node with an X.25 interface is used in an experimental data network of the Deutsche Reichsbahn. It is used together with an OSI communication controller for the 4 lower layers of the OSI reference model and a non-standard implementation of upper layer services for a transportation control application.

3. Application Experience

Computer communication application experience is gained on the basis of pilot projects in scientific institutions as well as in the business world.

Office automation and manufacturing automation are the main fields. Standard network services available in LAN and WAN are file transfer, data base access, remote job operation, electronic mail, file/print server.

Using these services specialized types of distributed data processing are implemented. The following examples shall demonstrate this.

In the agricultural sector for years the network based rain advisory service is run. After collecting daily data of soil humidity and of available water resources a model of artificial raining is processed and the results are distributed to the farmers, who are connected to the computer network directly or by telex machines.

The network based transportation control system for iron ore, which serves between the Rostock sea port and the iron works in Eisenhuettenstadt made a profit of 6 Mio Mark in the first year of application.

In the field of manufacturing automation data bases containing technical data are coming of. [sentence as published] Their interconnection, mainly by LAN, is a prerequisite for a drastic degression of the product throughput time in the manufacturing process. This problem has been solved by our institute for a pilot project.

4. Current Research in Computer Communication

The next step is in preparation. It will be characterized by the widening of networking into all areas of computer application. LAN begins to be found in scientific institutions, school classes of every level, enterprise offices, production departments, town halls. They are to be connected by a public data network. This will be a X.25 packet switched network.

Research work is directed to the further development of the data networks, to OSI end systems and to application oriented profiles.

In the data network field high speed LAN based on fiber optics are investigated. A research project for a new prototype of a packet switching system, consisting of packet switching nodes connected by a high speed LAN is underway. The nodes are built of fault-tolerant multimicrocomputers with more than 1000 line connections, more than 1000 packet's throughout and an availability of 99.997 percent. This work includes the investigation and pilot implementation of a network management system. In parallel experimental investigations for ISDN components are provided.

Oriented to end systems made of the Robotron computers OSI pilot implementations for message handling system (MHS), a directory service (DS), file transfer (FTAM) are in progress. Problems of the presentation layer and application layer elements are studied.

A project of a research network (FN) of the Academy of Sciences of the GDR is in its starting phase. A first structure is depicted in Figure 1. In the various campuses of the Academy are situated LANs, later to be connected by an optical backbone. The campus networks will be interconnected by the public data network. The connection to computer networks in other countries is also to be provided via this network. The aim of the FN is at one hand to interconnect the different institutes of the Academy and to provide them with special resources and mutual access. At the other hand it will be an experimental basis for computer network research.

Much work is oriented to software technology tools. Specification languages like SDL, ESTELLE and LOTOS are used for formal protocol specifications. Their verification and rapid prototyping are studied. A design and assessment tool SATURN[5] is used and the first version of the conformance test system TEKOS[6] is ready.

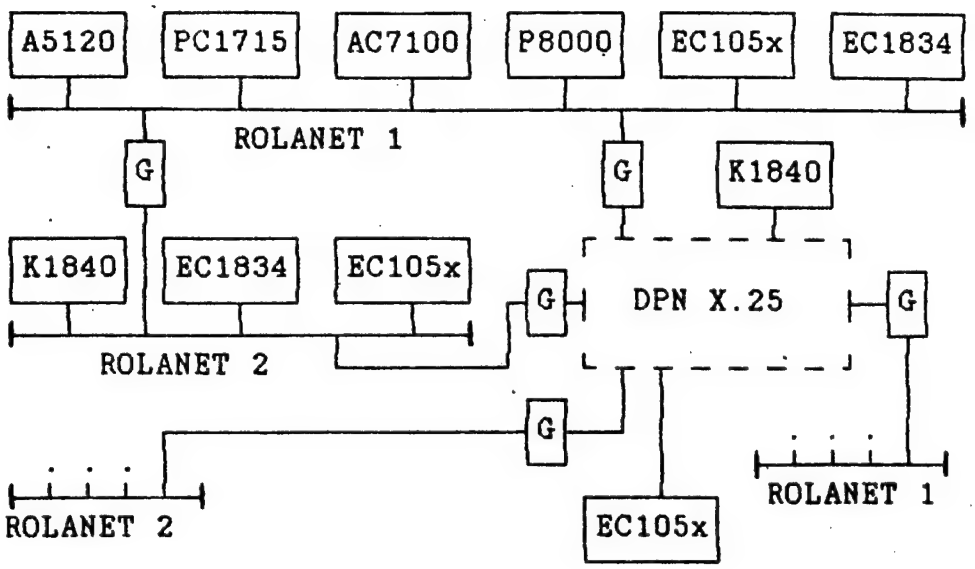

Figure 1. Research Network of the Academy of Sciences

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Tendencies in the LAN Evolution in Hungary and Technological Issues

36980025 Budapest EAST EUROCOMM '89, PROCEEDINGS OF THE FIRST INTERNATIONAL COMPUTERS COMMUNICATIONS CONFERENCE in English 25-26 Oct 89 pp 181-190

[Article by Gyorgy Leporisz, head of department, Tamas Razga, head of division, and Laszlo Uhereczky, chief engineer, Computer Research and Innovation Center, Budapest]

[Text] Abstract

The evolution, scope and technology of LAN in Hungary show special national characteristics. By analysing these national characteristics, the paper attempts to give a chronological review of the presently available LAN HW and SW elements, typical applications and configurations, and to indicate new comfort of LAN services in Hungary.

1. Introduction

1.1. Since its first appearance in Hungary in 1984-85, PC-LAN went through enormous changes in this country as well. Not only the conditions for network development have been established, but by today the need and practical experience of their concrete application have also come into existence: in brief the culture of the actual application of PC-local network systems has also been established in Hungary and is gaining ground.

Within the modest scope of this paper an attempt will be made to review the most important features and steps of this development process in the past and in the present and, based on these findings, to outline the short-term future of PC-LAN in Hungary.

Although a constant attempt will be made to be fully objective in this study, it cannot be avoided to voice here and there our subjective viewpoints too.

1.2. The wide-spread use of LAN in Hungary is strongly connected to the PC-boom, therefore it is mainly practiced in the form of PC-LAN systems.

For a good review of the topic it is worthwhile to list, if only in the form of key-words, the main steps of Hungary's PC history in the past 6 to 8 years:

--1981: the appearance and application of PROPER-8 and other 8-bit PCs

--1981: the appearance of the 16-bit IBM PC in the USA

--1982: the appearance of the first IBM PC in Hungary

--1982: the start of the domestic development of the prototype of PROPER-16 (PC compatible) and its production and application

--1983: the appearance of the domestic development of the prototype of PROPER-16W (PC/XT compatible) and its production and application

--1984: the first appearance of the experimental LAN systems in Hungary:

SzTAKI:COBUS (16 and 32-bits computers)
SzKI:PRONET (PROPER-16 computers)
KFKI:LOCHNESS (TPAs and CAMAC units)
BME:AMT network systems (8-bits computers)

--1985-86: the mass appearance of PC-CLONEs in Hungary

--1985-86: the appearance of imported LAN systems in Hungary:

TRANSNET, DLINK, ORCHIDE, NetWare

--1987-88: mass PC import through the so called "PC competition" supervised by the National Technical Development Committee

--1987: a sudden advance of cooperatives in domestic production and marketing of PCs

--1988: contract for the distribution of NOVELL-LAN products in Hungary

1.3. As the result of the above steps of development, the situation in Hungary may be characterized as follows at the end of 1988:

--60,000-80,000 PCs installed base
--3,000-4,000 PC-LAN workstation
--with the following shares of the various LAN products:

NOVELL: about 60-70 percent
PRONET: about 10-15 percent
ORCHIDE: about 5-10 percent
Others total: about 10-15 percent

--with the following typical configuration in the LAN systems:

1 FILE-SERVER)
1 PRINTER-SERVER) integrated in 1 server station
5-10 workstations

The majority of network application runs on MS-DOS 3.X and is built on dBASE-III PLUS, or CLIPPER network data base management and, in addition to this, mainly MAILING and PRINTER-SPOOLING functions are realized.

2. Main Motives in the Spread of PC-LAN in Hungary as Distinguished From International Developments

2.1. In the developed countries the appearance of PCs has been preceded by highly developed mainframe culture and considerable practice in teleprocessing. In these circumstances the PCs, as the lowest-hierarchy level, intelligent workstations of distributed processing, were given there a significantly more active and decisive role.

As opposed to all these, the PC revolution took place under very different circumstances in Hungary. Due to the number and the features of computers used in Hungary, mainframe application culture and, in connection to this, the teleprocessing practice could not really develop, the unfilled role of mainframes and teleprocessing therefore was taken over--under the pressure of necessity--to an increasing extent by PCs and the LAN systems built around them.

2.2. This peculiar PC role, obviously, has caused a large variety of problems:

--We had to wait until the performance of PCs has reached and then exceeded the typical processing level of PC ATs and had to get over the first set-backs caused by the use for this purpose of COMMODORE and other computers with similarly insufficient power.

--It did not take long to discover that even these higher performance computers are in themselves inadequate to take over the task of mainframes and that only their connection into local networks can give a chance to provide, in a complex way within a single system, the required processing capacity and the high-volume, multiple-access data base management.

--Also, it was quickly discovered that the PC-LAN systems are highly suitable to integrate the middle-range minicomputers used widely in Hungary, mainly the TPA/DEC compatible and DEC models, into the processing activity.

--As a summary the following specific features of LAN systems in Hungary can be outlined:

a. They are built basically and decisively on medium and high performance PCs;

b. Generally the mainframe is missing from the processing chain, its role is performed by the more sophisticated network architecture of the higher capacity PCs or, at best, by some middle-range computers;

c. The LAN systems substitute the mainframes also in external connections, and several LAN systems interconnected via teleprocessing devices form complex network systems;

d. LAN as a teleprocessing subsystem is integrated into the mainframe systems (X25 HOST GATEWAY, BSC GATEWAY, see: IIF).

2.3. It is a generally known and unfortunate fact that Hungary's telecommunication infrastructure is underdeveloped by European standards and its present level does not allow the development of nationwide information service system for which there is an increasingly urgent demand.

At the same time it is fortunate that PC-LAN systems are being established in such company environments where the level of local communication infrastructure is still satisfactory, well above the national average, and where there are means to build satisfactory data communication paths between these company PC-LAN "islands".

2.4. Last but not least the peculiar role of PC-LAN systems in Hungary is significantly influenced by the latest changes in our economic structure too.

Today it is clear that one of the preconditions of the pressing modernization of our economy is to speed up and make more effective the company information and decision making processes.

Since this evidence is accompanied by radical decentralization process of our economic structure, the role and importance of local processing systems operating in company environment have increased.

All these together will determine the development strategy of PC-LAN systems in Hungary and to our view they may be characterised by the following:

--PC-LAN systems operating in company environment, and developed for the needs of local processing;

--Within these company units processing is hierarchically distributed and its architecture is open to any type of further extension;

--These company PC-LAN islands will migrate gradually into a network first within a town then nationwide, providing information and reciprocal service to each other;

--Therefore, the Hungarian PC-LAN systems form the potential elements of a national information network build "bottom up", as opposed to the PC-LAN systems connected to the national networks build "top down" in the developed countries.

3. HW-SW Base in Hungary and Its Typical LAN Applications

3.1. Domestic LAN development started in the early eighties with three basic motives:

--The sudden slow down in domestic mainframe teleprocessing and computer network program which characterized the seventies; for the large amount of know-how accumulated during this program a new utilization area was provided by the LAN which has just been introduced internationally at this very time;

--The LAN HW-SW elements for establishing complex, multiple-host systems have fallen at that time under embargo restrictions, thus their substitution from domestic sources was an essential precondition for progress;

--It became clear soon that LAN systems strongly linked to the rapidly growing PC installed base, mark a new development direction in computer technology and that the domestic developments offered the most promising way of keeping up with the progress and producing the required know-how.

The results of the domestic LAN developments today have mainly historic and culture-creating value because, due to the limitations of small-scale production and sales, they have fallen victim to the present competition of low price imported products.

3.2. The HW-SW elements of domestic LANs are characterised by the purchase of some internationally established products.

A summary is given below on the most typical HW-SW elements used in Hungary and on their characteristics.

3.2.1. HW elements, communication characteristics:

--ARCNET

The most widely used LAN adapter with a share of about 70 percent in Hungary;
Also produced domestically.

--ETHERNET

The adapter is gaining ground also in Hungary;
Also produced domestically;
Marketed both in IBM-PC and DEC versions.

--Adapters developed-produced domestically:

COBUS (SzTAKI): 1 Mbit/sec, COAX, CSMA/CD
PRONET (SzKI): 1 Mbit/sec, twisted pair, CSMA/CD
LOCHNESS (KFKI): 1 Mbit/sec, COAX, CSMA/CD

3.2.2. SW basic system and its main features:

--NOVELL NETWARE

Runs on PC base, but it is extended also to other computers;
Typically MS-DOS 2.X or MS-DOS 3.X operating system;
Operates typically with ARCNET, ETHERNET adapter.

--PRONET 3.X

The Hungarian prototype of an IBM PC NETWORK compatible LAN;
MS-DOS 3.X operating system with LAN extensions;
Directly suitable for distributed processing: any of its stations may perform both SERVER and workstation functions;
Its communication interface, NETBIOS, has by now become industry standard;
Its various compatible versions are the most widely used in Hungary after the NOVELL NETWARE products;
Typically: uses PRONET, ARCNET adapter.

--DECNET

LAN system of DEC (PDP-11 and VAX) computers extended also to IBM PCs;
RSX, UNIX, VMS and MS-DOS operating system;
Its typical communication interface, TCP/IP has by now become industry standard;
The typical LAN system of the domestic TPA and DEC fleet;
Typically uses ETHERNET adapter.

3.2.3. The most typical LAN options

For the most widely used LAN options in Hungary--without aiming at completeness--see the summary below:

--Various LAN-GATEWAYs

X.25
BSC and asynchronous
TELEFAX
etc.

--CDNET, the version of CD-ROM LAN

--LAN-SPOOLERs

Printer, plotter

--LAN streamers

3.3. Typical LAN configurations and applications

The most typical LAN configuration consists of a central SERVER machine (FILE and PRINTER SERVER) and 5 to 15 workstations generally without hard disk.

There is no doubt, that the number of multi-user applications through LAN is on the increase. In these systems the correctness of concurrent access to the data base is assured by the use of the well-known dBASE-II PLUS marketed especially for this purpose or by the CLIPPER network data base management systems.

With the use of various LAN-GATEWAYs, network complexes are constructed more and more often, which integrate the PC-LAN systems and the mini-computers and mainframes into a single larger network.

In Hungary the largest system in this category is the so called IIF system, which, organized by the Hungarian Academy of Sciences, provides common-access information and mailing system services to a large number of scientific institutions.

The "IIF" system integrates 600 PCs, about 20-30 LAN systems (COBUS, NOVELL, PRONET, DECNET, etc.) X.25 network adapter elements and a dozen mini-computers and mainframes into a single system.

By now Hungary has passed the childhood years of PC-LANs, and we have the best hopes that it moves on the right track to the establishment and application of more and more up-to-date and comfortable LAN systems.

4. New Efforts and Answers To Increase the Level and Comfort of Domestic LAN Services

4.1. At this point in our paper we have completed the task of outlining the state of PC-LAN in Hungary and we shall turn our attention to new possibilities and answers from which the updating and comforting of our LAN services and the removal of its limitations can be expected.

What are these most pressing constraints and what does their possible removal involve?

A brief summary is given below on this topic without any aim at completeness also due to the size limitations of this paper.

4.2. With the appearance of the processors I80386, there are today PCs also on the Hungarian market whose processing capacity cannot always be fully utilized in the MS-DOS environment, thus, there is a more and frequent need to use UNIX, OS-2 or other (maybe later OS-3?) alternative operating systems.

It is a natural need to create the possibility of integrating these alternative operating systems into single PC-LAN system, i.e. to develop a heterogeneous LAN system.

The natural way to solve this problem will in all probability lead to the adoption of a new generation of PC-LAN, resulting, in most probably, discarding the SERVER-oriented NOVELL philosophy which is typical by now, and introducing and applying perhaps the new LAN technology built on the LAN MANAGER principle.

The earliest possible appearance in Hungary of this new LAN generation is specially motivated by the fact mentioned earlier that in Hungary the PC-LAN systems must also carry out mainframe tasks, thus the efficiency of the LAN technology has a special emphasis in this country.

From the widespread use of this new LAN generation in Hungary we expect that the conditions for real LAN applications can be established as early as possible both in the banking, insurance company, travel agency, etc. environment.

4.3. The HW-SW elements of LAN are becoming also in Hungary more and more routine-like commercial products, shifting the emphasis on the questions of network construction, operation and application, questions that are somewhat in the background nowadays. For these LAN topics to come to the front there is a need for new technological tools and a new LAN approach.

We call these new technological tools collectively LAN-TOOLS and here we mean HW-SW components such as:

--DLAP = Distributed LAN Application-Tools

which provides a set of SW tools for the network call of Remote Load, Remote Procedure Call and CLIENT-SERVER type functions.

--RESC = Remote Software Control-Tools

which provides remote monitoring and remote diagnostics of the network.

These tools have already appeared in the Hungarian application practice (SzKI) and it can be expected that they will gain further ground and their repertoire will be extended in the near future.

4.4. The LAN systems established in Hungary in the company environment operate everywhere in the environment of the traditional PABX systems and services, but today they are still fully independent from them.

It is logical to have the need and make the effort to converge and integrate the services of these two inhouse communication systems as early as possible.

This convergence has two promising and perspective ways.

--In the first way the independent existence of the LAN and PABX systems will remain unchanged and the convergence will appear as the extension of LAN services on the PABX base.

Some application examples in key-words:

FAX-GATE
BUEROPHONE
VOICE-MAILING
MULTI-MEDIA TELECONFERENCING

--In the second way a special LAN system can be built, based PABX on the cable system already present in office environment. This system:

On the one hand will not limit standard PABX services,
On the other hand will provide full LAN services,
And finally performs its speech, data and image transfer functions within a single architecture.

Through the gradual development of the second way of convergence, the now still independent LAN and PABX functions may lead, at the end of the process, to the ISDN system.

The establishment of convergence between the LAN and PABX systems and the introduction of MULTI-MEDIA services is a research project of special importance in Hungary.

Parallel Programmable Computer Systems in Telecommunications

36980025 Budapest EAST EUROCOMM '89, PROCEEDINGS OF THE FIRST INTERNATIONAL COMPUTERS COMMUNICATIONS CONFERENCE in English 25-26 Oct 89 pp 191-198

[Article by I. A. Mamzelev and K. G. Kniazev, Moscow Institute of Telecommunications]

[Text] Abstract

The control computer association (CCA)--a multicomputer microprocessor-based homogeneous computer system with a variable structure--is presented as an efficient control and computation means for new generation telecommunications systems.

The majority of telecommunications tasks are shown to be effectively decomposable into subtasks on the basis of large-scale (large-grained) decomposition methodology. The tasks of information switching are considered as typical examples. [end abstract]

The main way of improvement of the means and systems of telecommunications is the intensive use of digital computer systems in designing and constructing new generation communications systems, telecommunications management and control systems for the existing networks. The wide use of microprocessors and parallel processing is of special interest as an efficient and cost-effective way of increasing system modularity, availability and computer power. However, the use of these potential advantages strongly depends on our ability to decompose the application task. Our analysis shows, that the majority of telecommunications control, maintenance, management and administration tasks can be effectively decomposed into parallel subtasks on the basis of the structured large-scale decomposition methodology developed and investigated in reference 1. As a typical example we consider the task of information switching in a switching center. In effect, the task of information switching in a circuit switching center is to establish the one-to-one correspondence between different pairs on the set of nodes associated with subscriber circuits and truncs. The structured large-scale decomposition methodology (SLDM) makes it possible to provide two main kinds of parallelism in this task: functional and data parallelism. Data parallelism is determined by the possibility of concurrent path establishment between a variety of circuits. Functional parallelism can be

provided due to the possibility of concurrent execution of the set of typical functions during the path establishment between different pairs of circuits. We show that different ways of decomposition of the subscriber matrix and the set of function matrixes by parallel planes allow us to obtain all the well-known operation modes of control computers: load sharing and resource sharing, different kinds of backuping. A similar analysis was carried out for the combined switching centers, realising both packet and circuit switching. The method of combined switching is shown to be very promising due to the relatively high load of expensive communications channels. According to the open systems interconnection basic reference model the technological functions of the combined switching center can be presented in the form of the three-layered hierarchical functional structure including physical, data link and network layers. Functional elements of the physical layer are linked with different communications channels and thus can operate in parallel. Main functional elements of the data link layer algorithm: data reception, accumulation, frame error correction, frame coding, are data and control independent for each element of physical layer and thus can also be executed in parallel. We also show, that the main functions of the network layer: reception of signal, service and information frames, establishing and discarding of virtual channels, routing of information frames, actualisation of routing matrixes in the case of adaptive routing and dynamic flow control in the packet switching mode, also can be carried out concurrently for different frames. Due to the possibility of the effective decomposition of the algorithms on the basis of SLDM the control computer of a switching center on the principles of the control computer association model.[2] [as published] The generalised structure of the control computer association (CCA) is presented in Figure 1. The central element of the CCA is the computing module CM, which presents an algorithmically closed system able to realise each sequential algorithm (i.e. von Neiman computer model). All the CM's are interconnected in the computer association by the means of system interface modules SI and the communications network 1 of regular structure (mesh, ring, ...). The system consisting of the CM and the appropriate SI is called an elementary computing mocule ECM. The elements of the controlled and managed communications equipment, communications channels, switches, local controllers, are connected with ECM's by the means of communication interface modules CI and communications network 2 in the way, which provides each ECM the possibility of controlling a set of elements of equipment and each element of equipment the possibility of being controlled by a set of ECM's. The most difficult application tasks, such as optimisation, can be carried out by a group of ECM's coordinating their activities and working in parallel. The control computer association realises three main principles: concurrent operation of system elements, varyable and programmable interconnection structure, modularity (homogeneouity) applied both to the means of computation and the means of interfacing between ECM's and controlled equipment, which further develops the well-known ideas and principles of computer associations.[1] The operation of the control computer association can be presented as the sequence of the following phases: internal programming of communications networks 1 and 2 in order to create the desirable communications structures, gathering of data concerning the controlled equipment, information exchange between ECM's, autonomous operation of ECM's, exchange of control and

coordination data between ECM's and CE's. The control computer association can be effectively realised as a microprocessor based homogeneous multi-computer structure which makes it cost effective in a wide variety of characteristics.

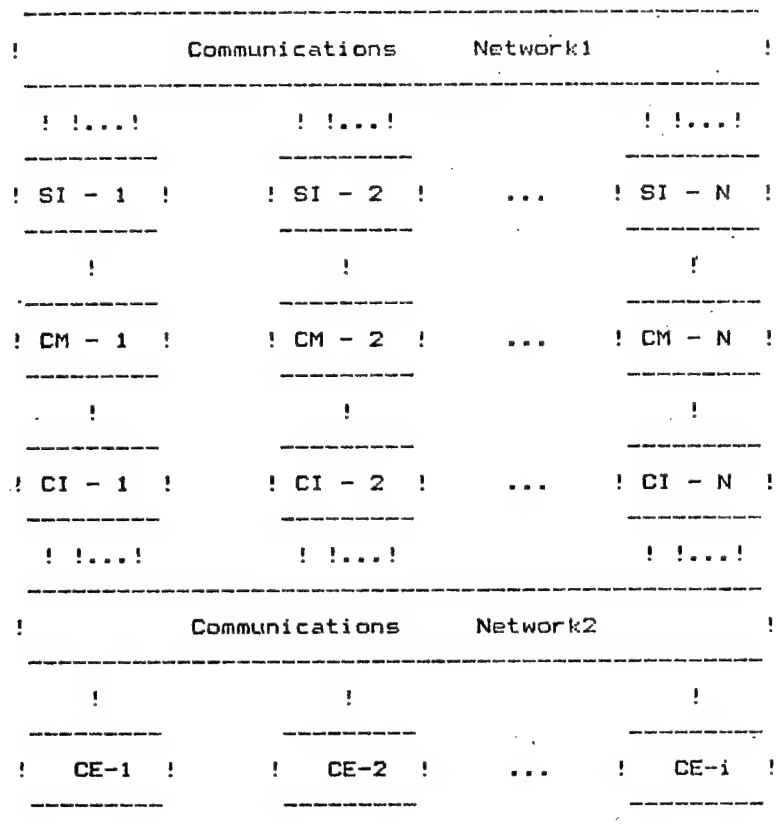

Figure 1. The Generalised Structure of the CCA

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Business and Investment Opportunities in Hungary

36980025 Budapest EAST EUROCOMM '89, PROCEEDINGS OF THE FIRST INTERNATIONAL COMPUTERS COMMUNICATIONS CONFERENCE in English 25-26 Oct 89 pp 213-217

[Article by Peter Szarvas, Hungarian Chamber of Commerce, Budapest]

[Text] I think it is not necessary to emphasize for South-East Asian businessmen what it means for an economy to involve foreign acting capital. In this context the countries of your region have achieved remarkable, exemplary results.

Hungary has taken this way only later, however in recent years--in conformity with the other measures of economic reform--we have been dynamically liberalizing our regulations concerning foreign capital investments. The new Act on Economic Associations valid as of January 1st, 1989, and the Act on Foreign Investments in Hungary meant a new step forward in this respect. The liberalization of foreign capital investments is not a single process, we are striving to create a market economy in other aspects of economic management.

Two years ago we have introduced the two-tier banking system, in which the National Bank of Hungary keeps the functions of the classical issuing bank, only. Financing of business transaction is performed by the commercial banks. A further step forward will be when commercial banks and banking institutions will be entitled to carry out foreign exchange operations. Joint ventures are acting also in the banking field, notably: Citibank, Budapest with a US participation, the Central European International Bank with a foreign majority share and Unicbank, in which the International Finance Corporation is also a shareholder.

In 1988 a new taxation system has been introduced: a general turnover tax is imposed on the products, while a personal income tax is imposed on earnings. As of 1989 a uniform profit tax (50 per cent) is imposed on all kinds of ventures, apart from the property forms. Foreign capital investments naturally enjoy tax allowances of different degrees. Economic associations with foreign participation, carrying out productive activity or operating a hotel, pay only a 20 per cent corporation tax in the first five years of their operation, provided the prime capital exceeds HUF 25 million (about USD 400 thousand) and the foreign participation is not less

than 30 per cent. Certain associations with foreign participation, moreover joint ventures operating in the field of electronics, vehicle industry, hotel construction, foodprocessing, packaging technique, etc., are fully exempt from corporation tax in the first five years after foundation. Usually all ventures, engaged in the introduction and adoption of material and energy-saving technologies are exempt from corporation tax. Reinvestment of profits also involves certain tax allowances. The law guarantees the repatriation of produced profits--upon taxation--in convertible currencies.

The foreign trade monopoly of the state is gradually terminated in Hungary. Since 1988 it is the subjective right of Hungarian enterprises to carry out foreign trade activity, with the exception of some strategically important products, indicated in the so called list of exceptions. Forty per cent of our imports is fully liberalized--no licence has to be asked for when importing these products to Hungary. This rate is expected to grow to 80 per cent within three years.

The new law on economic associations was enacted in 1989, making possible to establish internationally known types of firms and thus to mobilize inland private capital, on the one hand and to increase the involvement of foreign acting capital, on the other.

The newly passed act on "transformation" makes possible for state enterprises and cooperatives to become associations and to realize investments on taking over and partnership basis. All this is in compliance with our economic policy targets: to convert Hungarian economy into a mixed economy where both private capital and foreign acting capital play a significant role. The latter is encouraged by the act on foreign investments in Hungary, promulgated also on January 1st, 1989, which contains a certain progress in comparison to the previous regulations.

The appropriate protection of investments is guaranteed by the law; besides several bilateral agreements on investment protection have been concluded with western countries. We have recently joined the Multilateral Investment Guarantee Agency (MIGA).

When establishing a joint venture, the share of foreign property is not limited--the foreign share may reach even 100 per cent. Should the foreign participation not exceed 50 per cent no permission of the foreign exchange authority is necessary, the company can be established by a simple registration. Investments by a foreign majority share are liable to permission in the future, too.

Foreign investments can be effected in any branch, if not violating the statutory law or our international obligations, also in the field of trade and catering industry, where no joint ventures were usually allowed formerly.

In addition to our regulations of foreign investments, we have some comparative advantages, which may motivate investments in Hungary. We have a relatively highly-qualified but underpaid expert and manager staff, enabling the profitable operation of capital, and the adaption of modern technology

at an appropriate level. Though Hungary with 10 million inhabitants is a small market, but is a part of the East-European block and to some extent the COMECON-countries--within it the Soviet market--are accessible more easily through us. It is however, hindered to a certain extent by the rigid system of bilateral accounts, existing de facto within the CMEA, but we intend to make essential changes in this respect too, in the near future.

Now some words about already operating joint ventures.

Till the end of last year about 300 joint ventures were established in Hungary, involving about 350-400 million US dollars. In international comparisons it is not a significant sum, reflecting that we are still at a very early stage. On the basis of the figures you can see that in the average each joint venture involves as a share of foreign capital no more than about 1 million US dollars. The true facts behind the figures are the same: the majority of already operating joint ventures are associations with relatively small capitals. Of course, there are exceptions, our most significant joint venture is a float glass factory--a joint investment of the US Guardian Company and the Hungarian Glass Works--of a value of HUF 5 billion (about 80-85 million US dollars).

More than 40 per cent of already operating joint ventures has been established with an FRG or Austrian partner, but almost every western country has a joint venture in Hungary. Nowadays a very keen interest is shown on the part of Korean and Israeli businessmen, as a result of which a joint association has been recently set up by Daewoo concern of the Korean Republic and the Hungarian Credit Bank--with a considerable prime capital--interested first of all in the construction of hotels and different industrial projects. Negotiations have been started between Samsung Co. and the Hungarian Orion and the signing of a contract is soon expected for the establishment of a joint venture, producing colour TV-sets.

By my short remarks I have only wanted to call your kind attention to the most important aspects and details; in our informatory materials, available to you, you would find exact advices and guidance on the regulations of foreign investments and actual investment possibilities. The businessmen-members of our delegation have also brought here their concrete proposals which they will speak about themselves.

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